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The Effect of Motivation on Productivity in the Sudanese Construction Industry

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ABSTRACT **-** Construction industry in Sudan is considered as the largest industrial sector that has a direct effect on the state economy. The productivity of this sector has declined in Sudan and all over the world since 1960. This study is trying to measure the relationship between the productivity of construction industry in the Sudan and motivation. A mathematical model is adopted to measure this relationship. The model is: P = P0 + C1X1 + C2X2 + C3X3 Where: P, P0, X1, X2, and X3 represent Productivity, Productivity without motivation, physical motivation, moral motivation, and job satisfaction respectively. C1, C2, and C3 are the constants of physical motivation, moral motivation and job satisfaction respectively. The overall objective of this study is to enhance the productivity of construction industry in Sudan. Questionnaire was designed and distributed to numbers of respondents. A sample of 77 companies drawnrandomly from stratified samples, to represent the population of the industry's companies and work names. Three hundred and fifty persons involved in those companies responded to the questionnaire. Statistical package for social science (SPSS) used to analyze the collected data. The answers to the questionnaire's questions revealed that the motivation increased the productivity by 5.2 % and the relationship between the productivity and motivation in the respondent companies can be represented mathematically as: P = 0.408 – 0.130X1 + 0.304X2 - 0.209X3 This result means Sudanese companies only apply moral motivation to motivate their employees. Moreover, there is no enough physical motivation system in these companies, and the majority of workers are not satisfied with their jobs at these companies.

Keywords: *Construction industry, the productivity, motivation, Sudanese construction company.*

المستلخص - صناعة التشييد في السودان تُعتَبَر القطاع الأكبر صناعياً والذي له تأثيراً مباشراً على إقتصادِ الدولة. أشارت الدراسات إلى أن معدل الإنتاج في هذا القطاعِ متدنيُ في السودان وفي جميع أنحاء العالم منذ العام 1960. هذه الدراسةِ تُحاولُ أَنْ تَقِيسَ العلاقةِ بين معدلِ الإنتاج في صناعة التشييد السودانية والتحفيزِ. النموذج المستخدم لقياس هذه العلاقةَ هو النموذج الرياضي عبر المعادلة**P = P0 + C1X1 + C2X2 + C3X3** : حيث أن: **P** و **P0** و **X1** و **X2** و **X3** تُمثّلُ الإنتاجية ، الإنتاجية بدون تحفيزِ، الحافز المادي، الحافز المعنوي، والرضى الوظيفي على التوالي**C1**. و **C2** و **C3** و هي المعاملات للتحفيز المادي والمعنوي والرضى الوظيفي على التوالي. إنّ الهدفَ العامَّ لهذه الدراسة هو تحسّينَ معدلَ الإنتاجية لأعمالِ صناعة التشييد في السودان.تمإعدادإستبيانووزع على عدد من المفحوصين (عينات). تم إختيار عيّنة مِنْ 77 شركةِ و إسم عمل سوداني جميعها تعمل في مجال صناعة التشييد داخل ولاية الخرطوم. أختيرت هذه الشركات كعينة مصطفاة. داخل هذه الشركات تم الاختيار عشوائياً للعيناتِ. ثلاثمائة وخمسون من المنتسبين لهذه الشركات أجابوا على أسئلة الاستبيان. أستخدم برنامج التحليل الإحصائي **(SPSS)** لتَحليل البياناتِ المجمّعةِ. كَشفَت الأجوبة على أسئلةِ الإستبيان أنّ التحفيز يزيد الإنتاجية بمقدار 5.2 % وان العلاقةَ بين معدلِ الإنتاجية والتحفيزِ في الشركاتِ التي تمت دراستها يُمْكِنُ أن تَمْثل رياضياً بالمعادلة – **P = 0.408 – 0.130X1 + 0.304X2 0.209X3** هذه النتيجةِ تَعْني أن الشركاتَ السودانيةَ التي تعمل في مجال صناعة التشييد تُطبّقُ نظام التحفيزَ المعنوي فقط لتَحفيز مستخدميهم. علاوة على ذلك ، ليس هناك نظام مرضٍ للتحفيزِ المادي في هذه الشركاتِ، وأن أغلبية العاملين لَيسوا راضين عن وظائفهم.

INTRODUCTION

Construction is a high hazard industry that comprises a wide range of activities involving construction, alteration, and/or repair. Examples include residential construction, bridge erection and roadway paving.Many investors have directed their resources towards the construction industry sector. The construction industry is an important player in the economy of wordwild [3].The construction industry is still characterized by low productivity, fragmentation, divided responsibility, and conflicting objectives. The productivity in construction industry can be any tangible things (example buildings). As cited by Gupta [7] the decline in construction productivity has been a problem of wide concern for some time. There have been major breakthroughs leading to substantial productivity improvements in spite of all considerable researches and numerous reports on the subject.

In any organization it is the prime duty of the chief executive to get work done efficiently and properly to achieve the objectives. In order to achieve the objectives, it is necessary to create or develop a sense of motivation, desire, and work hard among the workers. Generic and construction-related literature indicate that motivation, effective communication, creating a strong organizational culture, effective goal setting and human resource development - education and training- are the cornerstones of any program directed towards increasing productivity. Employee motivation or the desire to perform is the foundation of productivity improvement.

IMPORTANCE OF THE STUDY

A. The importance of motivating employees and achieving job satisfaction.
B. The importance of having a depart mentor section inside the construction companies that understand how to motivate employees. Moreover, better knowledge of all motivation types to avoid errors causing the declination in production.
C. Applied research in one of the most important sectors of the economy and development in Sudan.

Research problem: Out of the researcher' experience in construction/academic fields in the Sudan, and focusing on the theme of motivating workers, indicators appeared to prove the existence of a large gap between the level of theoretical science and the level of practical application done by the departments of the construction companies. That applies to all types of motivation (physical, moral, and job satisfaction) in the construction industry. This gap may be the reason for the low level of productivity. The problem of this research is as follow:

A. To examine the declination of productivity of construction industry in Sudan.
B. To examine the relationship between productivity and motivation in the construction industry sector in Sudan.
C. Determine the effect of motivation on the productivity.

LITERATURE REVIEW

Construction productivity has been generating significant interest in both the construction industry itself and academia. Productivity management is currently recognized as a formal project management process in construction. However, most previous studies focused on defining factors that influence productivity and on measuring limited parts of activities at a micro level to investigate the relationship between factors and productivity. Construction productivity rates differ between projects because of the varying environments, characteristics, and project management efforts for each project [10]. Some of the productivity problems arise as a result of managerial discrepancies, stacking of trades, schedule acceleration, absenteeism, turnover, and job stress [12]. Basic principles are unknown, such as cost reduction, to many of those involved in the construction industry, [13]. While some are knowledgeable theoretically, but application of theoretical concepts on site is weak. The output of the right application of these

principles is expected to be in the work force performance, product innovation, quality, and ultimately the building life cycle cost is expected to be reduced. Customer satisfaction should be the main objective of any construction project. Otherwise, the resulting dissatisfaction could lead to unacceptable specifications and hence re-work will consequently be remarkable.

Construction Industry Definition:

In the fields of architecture and civil engineering, construction industry define as a process that consists of the building or assembling of infrastructure [17]. The activities are interrelated in a logical sequence in a sense that some activities cannot start until others are completed. An activity in a project is usually viewed as a job requiring time and resources for its completion. In general, a project is one time effort, and that is, the same sequence of activity may not be repeated in the future [8]. The construction industry is divided into many sectors, heavy sector (highways, sewer, pipelines etc), houses building sector (the on-site building, maintenance, repair, decoration, demolition etc), industrial, commercial and institutional sector (The assembly, manufacture or installation on a construction site of any equipment, machinery, fixtures or components, etc). All works in the construction industry are done by contractors. A contractor can be a person or company. A general Contractor (GC) or Builder is a company that will construct a major renovation project or build a new home. General Contractors usually hire and manage multiple subcontractors to build homes or do major renovations.

Construction Industry in Sudan:

The construction industry, particular the building industry in Sudan is considered as the largest industrial sector that has a direct effect on the national economy. Construction is the only sector of economic, which appears twice in the national accounts presented according to Unite Nation recommendations. Thus construction is one of the eleven sectors of the analysis of Gross Domestic Product (GDP) at the factor that cost by industrial origin; but the construction is also a component of fixed capital formation in the composition of gross domestic capital formation by types of assets. The construction appears a separate entry in labor statistics reported by the International Labor Organization [4]. During the period 1975/76 to 1985/86 GDP remained at constant and the 1981/82 factors cost rose from $ 5,780 million. In the intervening years this level fluctuated, reaching peaks of 6,120.4 million in 1976/77 and $ 6,063 million in 1981/82. The contribution of agriculture to GDP was 31.4 %, secondary products (manufacturing, construction and public utilities) 16.6 %, and services 51.9 %. In 1985/86 the per capita income was $ 400 [6]. The contribution of the construction industry to the Sudanese national income have fluctuant considerably during the past twenty years but has average of 4 % of the Gross Domestic Production (GDP) the value of one's year production of goods, and services by the nation compare to 10 % of the GDP accounted for the manufacturing industry, the contribution of the construction amounts to one third of the total industrial output. It is therefore a major source of employment in Sudan is the construction industry [4].

Sudan Employment:

The size of the country's economically active labor force has been difficult to estimate because of different definitions of participation in economic activity, and the absence of accurate data from official sources, particularly the 1973 and 1983 censuses, the Sudanese workforce in 2011 estimated to 54 % of the whole population according to The National Bank reported. In rural areas, large numbers of women and girl were engage in traditional productive occupations, but apparently many have not been included in counts of the active work force [11]. The international labor organization estimated in 1980 that the work force was about 6 million persons, or approximately 33% of the population. This

figure includes about 300,000 unemployed. It also included the many male Sudanese working in other Arab worlds, a loss to Sudan that many have amounted to as much as 50% of its professional and skilled work force [11]. The Sudanese workforce in 2011 estimated to 54 % of the whole population according to The National Bank report.

Productivity in the Sudanese Construction Industry:

In the micro economic in Sudan and worldwide, profitability is generally considered the best overall indicator of company performance. Profitability reflects the outcome of all managerial decisions with regarded to products or services produced, marketing strategy, level of investments, and, of course, the underlying efficiency with which inputs are converted to outputs. An organization, or any entity, can be highly efficient in producing goods or services, but this does not mean it is an effective organization. Organization success is the outcome measured by its effectiveness, efficiency and its product quality. Sudanese companies are still focusing on the quantity of outputs and competitive for that considering just the profitability [2].

Moreover, the lack of attention of motivation, traditional methods and the lack of training program had been behind the deterioration of the productivity in Sudan. The absence of motivation and training programs is leading to declining productivity of site workers. That is not means there is no progress in the construction productivity in Sudan. The improvement in the productivity in Sudan is not keep pace with the improvement which taking place worldwide. The economic policies and strategies imposed by the present government now days (encourage investment, encourage the imported of trucks, foreign companies, etc) have caused a positive effect on the construction industry productivity.

Productivity &Motivation:

Agreed with D. Scott Sink [15] productivity can be generally defined as:

1. Doing more with less business uses its resources. A satisfactory comprehensive and universal definition of productivity does not exist for construction [14]. In general terms it can be, and is, defined as output divided terms, output has successfully defied definition by investigators in precise and truly meaningful terms. This largely because of the widely varying by input. While input is normally relatively easy both to define and then to establish in quantitative.
2. Efficiency with which outputs are produced (the ratio of outputs to inputs).
3. Productivity designates how efficiently a sooner, which in turn creates satisfaction.

Job dissatisfaction can be one factor that will increase costs, produce time delays and generally reduce productivity on most types of projects. One way that construction management can influence productivity is by determining how smooth the work will flow and how much work can be accomplished.

Another more important way that construction management influences productivity is by how it influence worker's attitude, which is a major element in worker motivation and determining how much work will be accomplished. Output of construction, in which a unit, is expected when measured at lowest levels of physical size or cost, varies immensely in production content. Brocherding [6] reported that, in construction, higher productivity means seeing the final result.

Productivity Factors:

It is important to recognize that productivity is influenced by many factors, such as:

1. Motivation and attitude of employees.
2. The scale of operations.
3. Managerial competence
4. Organization workflow.
5. Human skills.
6. The quality and availability of raw materials.
7. The degree of technical sophistications of capital equipment.

Productivity in the United State is not keeping pace with that of many other

countries [21]. Quantity as well as quality of production has become a major area of concern for many manufacturers. The construction industry is among those faced with reports of low productivity by its work force. In nuclear power plant construction, for example, studies have revealed an annual productivity loss of 5% per year over the past decade.

Since construction labors amounts to an average of 25% of the direct capital cost of a project, ways and means must be found by the industry to arrest declining productivity [6]. Many items contribute to the falling of productivity "productivity factors", i.e., ineffective management and supervision that leaves material unavailable when it is needed, incompetence in staff personnel, delays in transmitting engineering information, communication breakdowns, rework, the unavailability of tools and equipment, lack of recognition and little participation in decision making by foremen and their crews.

On the labor union side, restrictive work practices in collective-bargaining agreements hamper contractors' efforts to employ and deploy their labor force efficiently. The nature of construction work also may have changed in recent years to reduce worker morale. During the 70's, the increasing number of "super projects" involving high technology brought new management problems.

Some workers, suddenly found themselves in work environments they did not understand, some work took on the appearance of repetitive factory-type labor. Workers might be employed for years on a single project, though they might prefer more mobility and more variety. In any case, a lack of worker motivation appears to be a factor in reduced productivity, increased absenteeism, and increased turnover.

Estimating Lost Labor Productivity in Construction:

As cited by Donald F. et al [5] one of the most contentious areas in construction claims is the calculation or estimation of lost productivity. Unlike direct costs, lost productivity is often not tracked or cannot be discerned separately and contemporaneously. As a result, both causation and entitlement concerning the recovery of lost productivity are difficult to establish. Compounding this situation, there is no uniform agreement within the construction industry as to a preferred methodology of calculating lost productivity. There are, in fact, numerous ways to calculate lost productivity.

Many methods of calculation are open to challenge with respect to validity and applicability to particular cases thus making settlement of the issue on a particular project problematic. What is productivity in construction and how is it measured? Several authors have answered this question in the following manner.

Mathematically, productivity can be defined by any of the equations … Productivity = Output ÷ input Productivity = Units ÷ work-hours Productivity = (Total output) ÷ (Total work-hours) Productivity is measured generally by the output per hour of input or relative measure of labor efficiency, either good or bad, when compared to an established base or norm as determined from an area of great experience. Productivity changes may be either an increase or decrease in cost.

International Productivity in Construction Industry:

The Construction Industry has suffered from a productivity decline since the 1960's [16] while all other non-farm industries have seen large boosts in productivity. The problems in contemporary construction include buildings that are behind schedule and over budget as well as adverse relations among the owners, general contractor, and architect. Using ideas developed by Toyota in their Toyota Production System and computer technology advances [9]. The productivity of the construction industry, as measured by constant contract dollars of new construction work per hourly work hour, has gradually declined (with some modest exceptions)

over the past 40 years at an average compound rate of -0.59%/year (Paul Teicholz, 2004). This is particularly alarming when compared to the increasing labor productivity in all non-farm industries, which have experienced an increasing productivity of 1.77%/year over the same time period.

Over the past decade, this trend has slightly improved but the decline in construction labor productivity relative to the rest of the industry has continued. This is a serious problem which indicates that over the past 40 years, construction projects have required significantly more field work hours per dollar of contract. In other words, the construction industry seriously lags other industries in developing and applying labor saving ideas and in finding ways to substitute equipment for labor. While there are a number of construction tasks that have been made more productive through the use of labor saving equipment, it is clear that, looking at the whole industry, there is a significant productivity problem [1].

Motivation: The theory of motivation for more than 50 years ago done by the works of Maslow in 1954; Herzberg et al in 1959; Alderfer in 1969; McClelland in 1961 and McGregor in 1960 [20]. The models used in the construction industry today have been developed from their theories. Their studies focused on motivation, employee needs and incentives in the construction industry. Motivation is one of those words for which everyone has a handy definition. No two definitions are quite the same. Listed below are some of the more popular definitions of the term:

1. Motivation as the willingness to exert high levels of effort towards organizational goals, conditioned by the effort's ability to satisfy some individual needs.
2. Motivation is the incitement of unconscious and subconscious forces in people which result is desirable behaviors. For the construction company, the desirable behavior is that construction workers exert a high level of effort in their work.
3. Motivation is the push of the mental forces to accomplish an action. Unsatisfied needs motivate. On the biological level basic human needs of food, shelter and survival are powerful motivators. On the psychological level, people need to be understood, affirmed, validated and appreciated. On the business level, motivation occurs when people perceive a clear business reason for pursuing a transfer of knowledge or practices.
4. Art or activity of developing desire to work amongst the workers or employers etc. to achieve the desired goal.
5. The wants, needs and beliefs that drive a character.
6. Acceptable behavior within organizations is defined, or at least outlined, in "business rules". In traditional information systems, some of these rules are partially enforced by application programs. This leads to redundancy in the representation of business rules, and results in consistency and responsibility problems. A possible solution is the enforcement of business rules by trigger mechanisms of active database systems.
7. What makes a character do what he or she does, whether those influences are goals, incentives, or the nature of the labor's character.
8. Tendency to expend effort to achieve a goal.
9. A psychological concept with no single universally accepted definition, but which organizational sociologists over concerns the determinants of intent, effort and tenacity, factors that push or pull us as individuals to behave in a particular manner.
10. The stimulation of consumers, salesperson's, employee's or dealer's innate desires and personal objectives by a program of recognition or achievement through merchandise or travel techniques-an incentive program.

11. The need or desire that determines an individual's effort, behaviors and actions.
12. The grounds or goals for the actions of a character.
13. The psychological feature that arouses an organism to action toward a desired goal; the reason for the action; that which gives purpose and direction to behavior.
14. Feelings that drive someone toward a particular objective.

Generally, motivation is the internal condition that activates behavior and gives it direction; energizes and directs goal-oriented behavior. The term is generally used for human motivation but, theoretically, it can be used to describe the causes for animal behavior as well [3]. According to various theories, motivation may be rooted in the basic need to minimize physical pain and maximize pleasure, or it may include specific needs such as eating and resting, or a desired object, hobby, goal, state of being, ideal, or it may be attributed to less-apparent reasons such as altruism, morality, or avoiding mortality. The fact that individuals tend to be motivated by different factors at different times [18].

The study: The researchers collected the main information of this study by a questionnaire. The questionnaires are often designed for statistical analysis of the responses. The questionnaire of this study includes two parts. The first part includes independent variables of the study, which contain the sample's general information. Part II contains the basic variables of the study, consisting of (24) questions divided into four axes to measure physical motivation, moral motivation, and job satisfaction respectively. The questionnaire before implemented, subject to many tests (consistency of the tool, ratifying arbitrators, Ratifying the internal consistency, and the stability of the measurement tool). In this study, random stratified sampling was collected. It is a method of sampling from a population. The researcher divided the population into relatively homogeneous subgroups before sampling. These subgroups were: Labors.

Civil engineers, Architect, Engineers (civil, architect) in charge (managers), and Others involved in construction industry. The numbers of the registered companies and work names in Sudan are 1269, where 60 % are working in Khartoum State (about 761 companies), and 40% are working outside of Khartoum State [5]. Not all registered companies are working in the field of construction industry now; many are out of this field. The researchers do not find approved document for nonworking companies.

Some companies are registered to a certain purpose and have never renewed their registration [13]. The researchers took 10% (professionals in statistics advice the researchers to take this rate) of the registered companies working in Khartoum State as the strata target sample for this study (77 companies). Inside the selected companies, random sample of labors and engineers were chosen. The researchers with aid of some people distributed the questionnaire to the target respondents. The Table 1 below indicates the distribution of the questionnaire.

Table 1: The distribution of the questionnaire.

Copies	Number	Percent
Distributed copies	350	100.00
Refused immediately	1	0.29
Collected copies	272	77.71
Distributed but not collected	77	22.00

The model:

In this study a mathematical model that describes mainly the relationship between productivity (P) as dependent factor and motivation (M) independent factor was designed the model formulated in a linear mathematical equation as follows:

$$\mathbf{P = P_0 + C_1X_1 + C_2X_2 + C_3X_3}$$

where: **P** represents the productivity (dependent variable). $\mathbf{P_0}$ represent the actual rate of productivity or initial productivity. $\mathbf{X_1}$ represent the physical motivation. $\mathbf{X_2}$ represent the moral motivation. $\mathbf{X_3}$ represent the job satisfaction. $\mathbf{C_1}$,$\mathbf{C_2}$, and $\mathbf{C_3}$ = constants. Table 2, below are the statistics included in the **SPSS SOFTWARE** used in the analyzing of the collected data: Descriptive statistics. Bivariate statistics. Predication of numerical outcomes. Prediction for identifying groups.

THE MAIN RESULTS:

Table 2: Statistics included in the SPSS SOFTWARE used in the analyzing of the collected data: Descriptive statistics. Bivariate statistics. Predication of numerical outcomes. Prediction for identifying groups.

Model Summary:				
Model	R	R Square	Adjust R Square	Std. Error of the estimate
1	0.227[a]	0.052	0.037	0.1599

Coefficients[a]

Model	Unstandardized coefficients		Unstandardized coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	0.408	0.134		3.043	0.003
LOGX1	-0.130	0.089	-0.117	-1.449	0.149
LOGX2	0.304	0.12	0.207	2.535	0.012
LOGX3	-0.209	0.091	-0.169	-2.305	0.022

***Column B indicates the value of the constants (C1, C2, and C3 respectively).**

ANALYSIS AND DISCUSSIONS

1. The majority of workers said that they did not have any types of motivation.
2. Moreover, a lot of the companies hired trained labors instead of training their own.
3. Most labors do not know the legalizations and laws of buildings in the state of Khartoum.
4. Labors agreed that there is no balance between their wages and the work they do.
5. Some engineers agreed that their companies offered some motivation, and most engineers are aware about the legalizations and laws of buildings.
6. Training of engineers is not available in most Sudanese companies.
7. The majority of clients stated that the productivity is weak and not in its optimum level. Re-work required in some cases.
8. The numbers of men in the construction industry field are almost three times the number of women which means that the monopoly of the industry in Sudan is for men.
9. The numbers of married and single employees in the construction industry field in Sudan are nearly equal. Moreover, the low divorce rate of workers in the construction industry sector may signal to some extent that the level of salaries in the construction industry are convincing (satisfied the worker's needs).

Since are of the major reasons for divorce is the financial problem. The numbers of labors who answered the questionnaire is only 6%, while engineers were 83.5%. This ratio, according to the perspective of the

researchers, affected the analysis of the questionnaire, where it became clear that educated workers (engineers - consultants - managers) do not have a significant change in their productivity if physical motivation system is applied in the company. This agrees with the findings of Abraham Maslow and Herzberg that physical motivation system has a positive effect only on labors (lower level workers) and not higher levels workers.

CONCLUSION

Construction industry services are provided in different ways throughout the world. Each country has developed its own pattern of work in which designers, contractors, suppliers, and others cooperated in different ways, to achieve a common purpose. Financial control is important as well as quality control. The management of construction industry is shared by many responsible parties i.e. contractors, clients, supervisory management. The failure of any of these parties to perform and carry out his role properly will interrupt and delay the scheduling of the proposed work plan. In Sudan, the living standard and conditions for a citizen is considered relatively low in comparison to other regional and international economics. Thus, the contribution in general recommendations: raising the living standards of a Sudanese is one of the goals of this study, which is done through laying a motivation system for all workers in the construction field. This gives a double advantage, the raise of a worker's productivity and the living standard. From Model Summary table above R Square 0.052 is means that the motivation increased the productivity by 5.2 % in the respondents companies. The researchers were stated the relationship between motivation and productivity in the respondents companies as: **P = 0.408 - 0.130X1 + 0.304X2 - 0.209X3.** These results, with refer to respondent companies, do not reflect a defect in motivation itself, but rather reflect the flaws of managers and those involved in the construction industry in the Sudan. To improve productivity level in Sudanese construction industry the researchers recommends

1. Making the construction field more appealing to labors by providing reasonable motivations.
2. Developing an integrated program of motivation to deal with the different situations in order to maintain the level of the staff from dropping out and raise their productivity.
3. Focusing on physical motivation, and its provision to all workers in construction companies in the Sudan, especially low level labors.
4. Training, for workers, increases the degree of acceptance of motivation
5. Training the Sudanese workers for the requirements of the construction market jobs.

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